



# **CHEMISTRY**

## **BOOKS - MTG WBJEE CHEMISTRY (HINGLISH)**

### **RADIOACTIVITY AND NUCLEAR CHEMISTRY**

**Wb Jee Workout Category 1 Single Option  
Correct Type**

1. An element A emits an alpha particle and form B. A and B are

A. isotopes

B. isobars

C. isotones

D. nuclides

**Answer: D**



**View Text Solution**

2. If the amount of radioactive substance is increased three times, the number of atoms disintegrated per gram per unit time would be

A. double

B. remain one third

C. triple

D. not changed

**Answer: D**



**View Text Solution**

3. Which one of the following notations shows the product incorrectly ?

A.  ${}_{99}\text{Cm}^{242}(\alpha, 2n){}_{97}\text{Bk}(243)$

B.  ${}_5\text{B}^{10}(\alpha, n){}_7\text{N}^{13}$

C.  ${}_7\text{N}^{14}(n, p){}_6\text{C}^{14}$

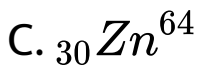
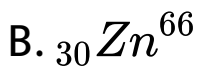
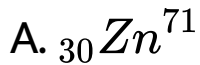
D.  ${}_{14}\text{Si}^{28}(d, n){}_{15}\text{P}^{29}$

**Answer: A**



**View Text Solution**

4. Which of the following isotopes is likely to be most stable?



D. None of these

**Answer: C**



**View Text Solution**

5.  ${}_{92}\text{U}^{235}$  belongs III B of the periodic table. If it loses one alpha particle, the new element will belong to group

A. I B

B. I A

C. III B

D. V B

**Answer: B**



**View Text Solution**

6.  $\beta$  - particle is emitted in radioactivity by

A. conversion of proton to neutron

B. from outermost orbit

C. conversion of neutron to proton

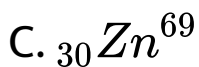
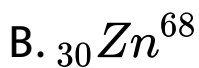
D. none of these.

**Answer: C**



**View Text Solution**

7. The product obtained after positron emission from  ${}_{31}\text{Ga}^{68}$



**Answer: B**



**View Text Solution**



8. In the radioactive decay,  ${}_{92}\text{X}^{232} \rightarrow {}_{89}\text{Y}^{20}$ ,  
how many  $\alpha$  and  $\beta$  particles are ejected from  
X to form Y?

A.  $3\alpha$  and  $3\beta$

B.  $5\alpha$  and  $3\beta$

C.  $3\alpha$  and  $5\beta$

D.  $5\alpha$  and  $5\beta$

**Answer: A**



**View Text Solution**

9. In the case of a radioisotope, the value of .....and .....are identical in magnitude. The value is

A.  $1/0.693$

B.  $(0.693)^2$

C.  $0.693$

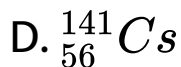
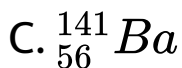
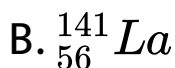
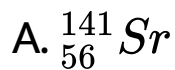
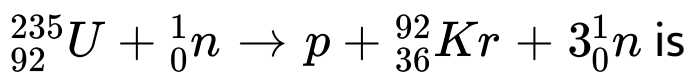
D.  $(0.693)^{1/2}$

**Answer: D**



**View Text Solution**

10. The product  $p$  of the nuclear reaction



**Answer: C**



**View Text Solution**

11. The nuclides with  $Z > 20$  lying below the stability belt decay by

A.  $\beta^+$ -emission

B. K-electron capture

C. both (a) and (b)

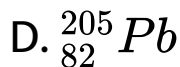
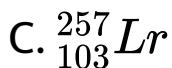
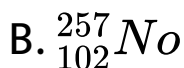
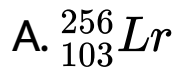
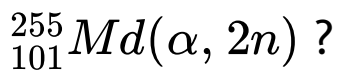
D.  $\beta^-$ -emission

**Answer: C**



**View Text Solution**

12. What will be the product of reaction,



**Answer: C**



**View Text Solution**

13. If  $n_t$  number of radiatoms are present at time  $t$ , the following expression will be a constant.

A.  $n_t / t$

B.  $\ln n_t / t$

C.  $d \ln n_t / dt$

D.  $t \cdot n_t$

**Answer: C**



**View Text Solution**

14. An artificial radioactive isotope gave  ${}_{7}^{14}N$  after two successive  $\beta$ -particle emissions. The number of neutrons in the present nucleus must be

- A. 9
- B. 14
- C. 5
- D. 7

**Answer: A**



**View Text Solution**

15.  $^{23}\text{Na}$  is more stable isotope of Na. Find out the process by which  $^{24}_{11}\text{Na}$  can undergo radioactive decay.

A.  $\beta^-$ -emission

B.  $\alpha$ -emission

C.  $\beta^+$ -emission

D. K-electron capture

**Answer: A**



**View Text Solution**



16. half life of a radioactive substance which disintegrates by 75% in 60 minutes will be

A. 120 min

B. 30 min

C. 45 min

D. 20 min

**Answer: B**



[View Text Solution](#)

17. A radioisotope has a ..... Of 10 days. If today 125 g of it is left, what was its weigh 40 dayscarlicr?

A. 600 g

B. 1000 g

C. 1250 g

D. 2000g

**Answer: D**



**View Text Solution**

18. A radioisotope will not emit

- A.  $\alpha$  and  $\beta$ -rays simulta
- B.  $\beta$  and  $\gamma$ -rays simultaneously
- C.  $\gamma$  and  $\alpha$ -rays simultaneously
- D.  $\gamma$  -rays only

**Answer: D**



**View Text Solution**

19. The half-life of a radioactive element is 10 hours. How much will be left after 4 hours in 1 g atom sample ?

A.  $45.6 \times 10^{23}$  atoms

B.  $4.56 \times 10^{23}$  atoms

C.  $4.56 \times 10^{24}$  atoms

D.  $4.56 \times 10^{25}$  atoms

**Answer: B**



**View Text Solution**

20. Unstable substances exhibit higher radioactivity due to

- A. low p/n ratio
- B. high p/n ratio
- C.  $p/n = 1$
- D. none of these

**Answer: A**



**View Text Solution**

21. The order of density of the nucleus is

A.  $10^8 \text{ kg/cc}$

B.  $10^{11} \text{ kg/cc}$

C.  $10^{15} \text{ kg/cc}$

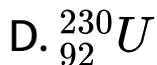
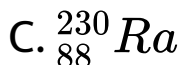
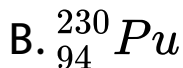
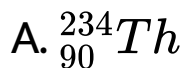
D.  $10^{18} \text{ kg/cc}$

**Answer: B**



**View Text Solution**

22. The nucleus resulting from  ${}_{92}^{238}\text{U}$  after successive loss of two alpha and four beta particles is



**Answer: D**



**View Text Solution**

**23.** Which of the following elements belongs to  $4n$  - series?

A. Pb - 207

B. Bi - 209

C. Pb - 208

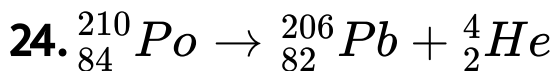
D. Pb - 206

**Answer: C**



**View Text Solution**





From the above nuclear reaction, predict the position of polonium in the periodic table (lead belongs to group IV A).

A. IIA

B. IV B

C. VI B

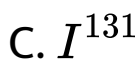
D. VI A

**Answer: D**



**View Text Solution**

25. Which one of the following radiosotopes is used in the treatment of blood cancer?



**Answer: A**



**View Text Solution**

26. If the mass defect of  ${}^9_4X$  is 0.090 amu, their binding energy per nucleon is (1 amu = 931.5 MeV)

A. 9.315 MeV

B. 931.5 MeV

C. 83.0 MeV

D. 8.38 MeV

**Answer: A**



**View Text Solution**

27. Arrange the following in increasing order of their penetrating power.

( $\alpha$ ,  $\beta$ ,  $\gamma$ , X-rays).

A.  $\alpha$ -rays It  $\beta$ -rays It  $\gamma$ -rays It X -rays

B.  $\alpha$ -rays It  $\beta$ -rays It X -rays It  $\gamma$ -rays

C. X -rays It  $\gamma$ -rays It  $\beta$ -rays It  $\alpha$ -rays

D.  $\gamma$ -rays It  $\beta$ -rays It  $\alpha$ -rays It X -rays

**Answer: B**



**View Text Solution**

28. The half-life of Rn is 46 days, what amount will be left from 2 mole of it after 138 days?

A. 0.25 mole

B. 1.25 mole

C. 0.40 mole

D. 0.62 mole

**Answer: A**



**View Text Solution**

29. Radioactivity of a sample ( $Z = 22$ ) decreases 90% after 10 years. What will be the half-life of the sample ?

A. 5 years

B. 2 years

C. 3 years

D. 10 years

**Answer: C**



**View Text Solution**

30.  ${}_{11}\text{Na}^{24}$  is radioactive and it decays to

A.  ${}_{9}\text{F}^{20}$  and  $\alpha$ -particles

B.  ${}_{13}\text{Al}^{24}$  and positron

C.  ${}_{11}\text{Na}^{23}$  and neutron

D.  ${}_{12}\text{Mg}^{24}$  and  $\beta$ -particles.

**Answer: D**



**View Text Solution**

**Wb Jee Workout Category 2 Single Option  
Correct Type**

1. A sample of U - 238 (half-life =  $4.5 \times 10^9$  yr) ore is found to contain 23.8 g of U-238 and 20.6 g of Pb - 206. What will be the age of the ore?

A.  $5.5 \times 10^{12}$  years

B.  $6.0 \times 10^8$  years

C.  $4.5 \times 10^9$  years

D.  $5.5 \times 10^{14}$  years



**Answer: C**



**View Text Solution**

2. If the half-life of a radioisotope is 4 days, then how long would it take for 75% disintegration of the sample?

- A. 8 days
- B. 10 days
- C. 12 days
- D. 14 days

**Answer: A**



**View Text Solution**

3. Calculate the no. of disintegrations which 1 g of radioactive element  $^{200}\text{X}$  undergoes per sec.  $t_{1/2}$  of X = 1000 years.

A.  $3.66 \times 10^{10}$  dps

B.  $6.6 \times 10^{10}$  dps

C.  $10^{11}$  dps

D.  $1.0 \times 10^{10}$  dps

**Answer: B**



**View Text Solution**

4. Sulphur – 35 (34.96903 amu) a  $\beta$ -particle but no  $\gamma$ -ray. The product is chlorine - 35 (34.96885 a.m.u). The maximum energy emitted by the  $\beta$ -particle is

A. 16.758 MeV

B. 1.6758 MeV

C. 0.16758 MeV

D. 0.016758 MeV

**Answer: C**

 [View Text Solution](#)

5. Mass of  ${}^7_3\text{Li}$  is 7.016004 amu. Mass of proton is 1.007277 amu and mass of neutron is 1.008665 amu. Mass defect of lithium nucleus in amu is

A. 0.04948 amu

B. 0.04050 amu

C. 0.04052 amu

D. 0.04055 amu

**Answer: A**



**View Text Solution**

6. The radioisotope, tritium ( ${}^3_1H$ ) has a half-life of 12.3 years. If the initial amount of tritium is 32 mg. how many milligrams of it would remain after 49.2 years?

A. 1 mg

B. 2 mg

C. 4 mg

D. 8 mg

**Answer: B**



**View Text Solution**

7. A human body required 0.01 M activity of a radioactive substance after 24 hours. Half life of the radioactive substance is 6 hours. The

injection of maximum activity of the radioactive substance that can be injected is

A. 0.08

B. 0.04

C. 0.16

D. 0.32

**Answer: C**



**View Text Solution**

8. A radioactive isotope having a half life of 2.3 days was received after 9.2 days. It was found that there were 300 mg of the isotope in the container. The initial amount of the isotope was

A. 3600 mg

B. 1200 mg

C. 2400 mg

D. 4800 mg.

**Answer: D**





[View Text Solution](#)

9. The wt. in g of 1 curie of radioactive element

$^{200}\text{X}$  having a  $t_{1/2}$  of 63.3 is

A.  $3.7 \times 10^{-8} \text{ g}$

B.  $200\text{g}$

C.  $7.4 \times 10^{-8} \text{ g}$

D.  $3.0 \times 10^{-8} \text{ g}$

**Answer: C**



10. A piece of wood from an archaeological source shows a C - 14 activity which is 60% of the activity found today. Calculate the age of the sample ( $t_{1/2}$  for  ${}^{14}_6\text{C} = 5770$  years).

- A. 3515 years
- B. 300 year
- C. 4253 year
- D. 4000 years

**Answer: C**



**View Text Solution**

**11.** Equal amounts of two samples of carbon were burnt and the radioactivities of  $CO_2$  formed were measured. The activities were 2100 and 1400 counts per week respectively. What will be the age difference of the sample.

[  $t_{1/2}$  for  $C^{14} = 5600$  years ]

A. 2002 years

B. 2345 years

C. 4250 years

D. 3343 years

**Answer: D**



**View Text Solution**

**12.** The half-life of a radioisotope is 20 years. If the sample has an initial activity of 640 dps, then what will be its activity after 80 years?

A. 20 dps

B. 30 dps

C. 40 dps

D. 50 dps

**Answer: C**



**View Text Solution**

**13.** A radioelement has atomic number 90 and mass number 232. What is the atomic number

and mass number of the end product obtained by loss of  $6 - \alpha$  and  $4 - \beta$  particles?

A. 82208

B. 88206

C. 82206

D. 84, 204

**Answer: A**



**View Text Solution**

14. A wood piece is 11460 years old. What is the fraction of  $^{14}\text{C}$  activity left in the piece ? (Half-life period of  $^{14}\text{C}$  is 5730 years)

A. 0.12

B. 0.25

C. 0.50

D. 0.75

**Answer: B**



**View Text Solution**

15. At a certain instant a piece of radioactive material contains  $10^{12}$  atoms. The half-life of the material is 30 days. What will be number of disintegrations per second of the sample at that instant?

A.  $3.96 \times 10^6$  dps

B.  $4.02 \times 10^5$  dps

C.  $2.66 \times 10^5$  dps

D.  $1.96 \times 10^6$  dps

**Answer: C**





View Text Solution

## Wb Jee Workout Category 3 One Or More Than One Correct Type

1. The number of  $\alpha$  and  $\beta$  emitted in the nuclear reaction  ${}_{92}^{238}\text{U} \rightarrow {}_{82}^{214}\text{Pb}$  is

A.  $8\beta$

B.  $6\alpha$

C.  $2\beta$

D.  $5\alpha$

**Answer: B::C**



**View Text Solution**

2. What of the following is/are correct?

A.  $\alpha$ -rays are more penetrating than  $\beta$ -rays

B.  $\alpha$ -rays have greater ionizing power than

$\beta$ - rays.

C.  $\beta^-$  particles are not present in the nucleus, yet they are emitted from the nucleus.

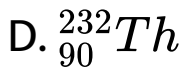
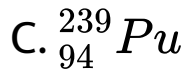
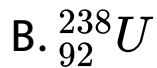
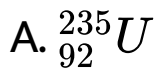
D.  $\gamma$ -rays are electromagnetic rays.

**Answer: B::C::D**



**View Text Solution**

**3. The fissionable material commonly used in atomic bomb is (are)**

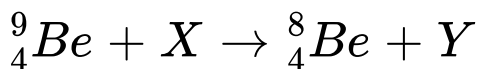


**Answer: A:C**



**View Text Solution**

**4.** In the nuclear transmutation.



(X, Y) is (are)

A.  $(\gamma, n)$

B.  $(p, D)$

C.  $(n, D)$

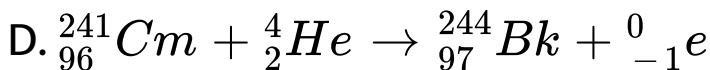
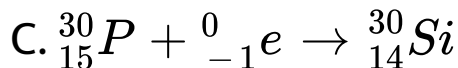
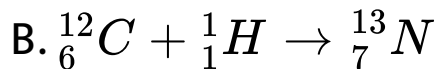
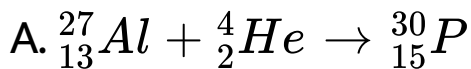
D.  $(\gamma, p)$

**Answer: A::B**



**View Text Solution**

5. Nuclear reactions accompanied with emission of neutron(s) are



**Answer: A::D**



**View Text Solution**

**6. Which of the following is/are correct?**

A. Atom bomb and H-bomb both are example of nuclear fission.

B. Nuclear reactions are markedly affected by temperature.

C. Electron and positron both have same mass.

D. The lesser the half-life, the lesser is the number of atoms undergoing decay in a given time.

**Answer: C**



[View Text Solution](#)

7. Which of the following is/are not correct?

A. Loss of  $\beta$  - particle produces an isotope.

B. Loss of one  $\alpha$  and  $\beta$ - particles produces an isotope.

C. Loss of mass takes place only during nuclear fission or fusion

D. Uranium is a transuranic element.



**Answer: C::D**



**View Text Solution**

**8.** When an isotope undergoes K-capture, its mass number

A. remains the same while the atomic number increases by one

B. remains the same while the atomic number increases by two

C. remains the same while the atomic number decreases by one

D. remains the same while the atomic number decreases by two.

**Answer: C**



**View Text Solution**

9. The value of disintegration constant of a radioactive isotope

- A. decreases with increasing temperature
- B. decreases will increasing pressure
- C. increases with increasing concentration
- D. is independent of temperature, pressure  
and concentration.

**Answer: D**



**View Text Solution**

10. A plot of the number of neutrons ( $n$ ) against the number of protons ( $p$ ) of stable nuclei exhibits upward deviation from linearity for atomic number,  $Z > 20$ . For an unstable nucleus having  $n, p$  ratio less than 1, the possible mode(s) of decay is(are)

- A.  $\beta^-$ -decay ( $\beta$ emission)
- B. orbital or K- electron capture
- C. neutron emission
- D.  $\beta^+$ -decay (positron emission).

**Answer: B::D**



**View Text Solution**

**Wb Jee Previous Years Questions Category 1  
Single Option Correct Type**

1. The half-life for decay of  $^{14}\text{C}$  by  $\beta$ -emission is 5730 years. The fraction of  $^{14}\text{C}$  decays, in a sample that is 22,920 years old, would be

A.  $1/8$

B.  $1/16$

C.  $7/8$

D.  $15/16$

**Answer: D**



**View Text Solution**

2. During the emission of a positron from a nucleus, the mass number of the daughter element remains the same but the atomic number

A. is decreased by 1 unit

B. is decreased by 2 units

C. is increased by 1 unit

D. remains unchanged.

**Answer: A**



**View Text Solution**

**3.**  $\beta$ -emission is always accompanied by

A. for of antineutrino and  $\alpha$ -particle

B. emission of  $\alpha$ -particle and  $\gamma$ -ray

C. formation of antineutrino and  $\gamma$ -ray

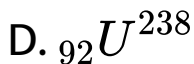
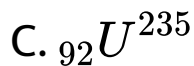
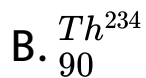
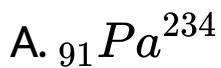
D. formation of antineutrino and positron.

**Answer: C**

 [View Text Solution](#)

4.  ${}_{98}\text{Cf}^{246}$  was formed along with a neutron when an unknown radioactive substance was bombarded with  ${}_{6}\text{C}^{12}$ . The unknown substance was





**Answer: C**



**View Text Solution**

5.  $({}_{32}\text{Ge}^{76}, {}_{34}\text{Se}^{76})$  and  $({}_{14}\text{Si}^{30}, {}_{16}\text{S}^{32})$  are example of

- A. isotopes and isobars
- B. isobars and isotones
- C. isotones and isotopes
- D. isobars and isotopes.

**Answer: B**



**View Text Solution**

6. An element E loses one  $\alpha$  and two  $\beta$ -particles in three successive stages. The resulting element will be

- A. an isobar of E
- B. an isotone of E
- C. an isotope of E
- D. E itself.

**Answer: C**



**View Text Solution**

7. If radium and chlorine combine to form radium chloride, the compound would be

A. half as radioactive as radium

B. twice as radioactive

C. as radioactive as radium

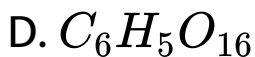
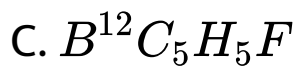
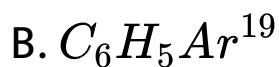
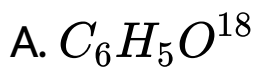
D. not radioactive.

**Answer: C**



**View Text Solution**

8.  $C_6H_5F^{18}$  is a  $F^{18}$  radio - isotope labelled organic compound.  $F^{18}$  decays by positron emission. The product resulting on decay is



**Answer: A**



**View Text Solution**

9. The half-life of  $C^{14}$  is 5760 years. for a 200 mg sample of  $C^{14}$ , the time taken to change to 25 mg is

A. 11520 years

B. 23040 years

C. 5760 years

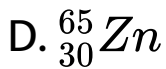
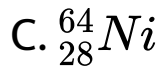
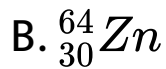
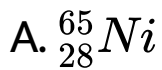
D. 17280 years.

**Answer: D**



**View Text Solution**

**10.** The nucleus  ${}_{29}^{64}\text{Cu}$  accepts an orbital electron to yield



**Answer: C**



**View Text Solution**

**11.** The half-life period of ..... is 60 days. The radioactivity after 180 days will be

A. 0.25

B. 0.125

C. 33.3 %

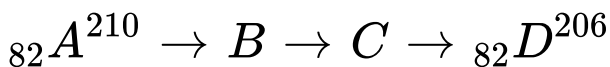
D. 3.0 %

**Answer: B**



**View Text Solution**

**12.** Consider the radioactive disintegration



The sequence of emission can be



A.  $\beta, \beta, \beta$

B.  $\alpha, \alpha, \beta$

C.  $\beta, \beta, \gamma$

D.  $\beta, \beta, \alpha$

**Answer: D**



**View Text Solution**

**Wb Jee Previous Years Questions Category 2**  
**Single Option Correct Type**

1. A piece of wood from an archaeological sample has  $5.0 \text{ counts min}^{-1}$  per gram of C-14, while a fresh sample of wood has a count of  $15.0 \text{ min}^{-1}$ . If half-life of C-14 is 5770 years, the age of the archaeological sample is

- A. 8,500 years
- B. 9,200 years
- C. 10,000 years
- D. 11,000 years

**Answer: B**



**View Text Solution**